CITY OF SODA SPRINGS (PWS 6150017)
SOURCE WATER ASSESSMENT FINAL REPORT

February 6, 2003

State of Idaho
Department of Environmental Quality

Executive Summary

Under the Safe Drinking Water Act Amendments of 1996, all states are required by the U.S. Environmental Protection Agency (EPA) to assess every source of public drinking water for its relative sensitivity to contaminants regulated by the Act. This assessment is based on a land use inventory of the designated assessment area and sensitivity factors associated with the springs and aquifer characteristics.

This report, *Source Water Assessment for City of Soda Springs, Idaho*, describes the public drinking water system (PWS), the boundaries of the zones of water contribution, and the associated potential contaminant sources located within these boundaries. This assessment should be used as a planning tool, taken into account with local knowledge and concerns, to develop and implement appropriate protection measures for this source. **The results should <u>not be</u> used as an absolute measure of risk and they should <u>not be</u> used to undermine public confidence in the water system.**

The City of Soda Springs (PWS #6150017) is a community drinking water system that consists of five spring sources: Formation Spring, Ledge Creek Springs #1, #2, #4 and Ledge Creek "A." The Formation Spring is located approximately 2.5 miles northeast of the City of Soda Springs. The Ledge Creek Springs (#1, #2, #4, "A") are located approximately one mile northeast of the City of Soda Springs. Water is fed to a one million-gallon storage reservoir and treated using gas chlorination. The system currently serves approximately 3,300 persons through 1,550 unmetered connections.

The potential contaminant sources within the delineated capture zones include mines. Additionally, Trail Canyon Road is a transportation corridor that cross the delineations. If an accidental spill occurred from this corridor, inorganic chemical (IOC) contaminants, volatile organic chemical (VOC) contaminants, synthetic organic chemical (SOC) contaminants, or microbial contaminants could be added to the aquifer system. Another contaminant source identified within the delineated areas that may contribute to the overall vulnerability of the water sources is Trail Creek. A complete list of potential contaminant sources is provided with this assessment

For the assessment, a review of laboratory tests was conducted using the State Drinking Water Information System (SDWIS). Our records indicate no VOC or SOC have been detected at the spring sources. Furthermore, our records indicate no microbial contaminants have been detected in the distribution system. The IOCs barium, fluoride, nitrate, selenium, and beryllium have been detected in the drinking water, but at levels below the maximum contaminant level (MCL) for each chemical. Formation Spring detected arsenic in January 1998, 1999, and 2000 with concentrations ranging from 0.005 milligrams per liter (mg/L) to 0.009 mg/L. The Ledge Creek Springs detected arsenic in January 2000 at a concentration of 0.006 mg/L. In October 2001, EPA lowered the arsenic MCL from 0.050 mg/L to 0.010 mg/L, giving systems until 2006 to comply with the new standard. EPA requires reporting to the Consumer Confidence Report (CCR) if concentrations of regulated compounds are greater than half their MCL. Further information and health side effects can be researched at <u>http://www.epa.gov/safewater/ccr1.html</u>.

The capture zones for the springs intersect a priority area for the IOC nitrate. The nitrate priority area is where greater than 25% of area springs show nitrate values above 5 mg/l. In addition, the capture zones for the Formation Spring intersect a priority area for the SOC atrazine. Organic priority areas are areas where greater than 25% of area wells show levels greater than 1% of the primary standard or other health standards (MCL for atrazine is 0.003 mg/L). Atrazine is a widely used herbicide for control of broadleaf and grassy weeds.

Final susceptibility scores are derived from system construction scores and potential contaminant/land use scores. Therefore, a low rating in one category coupled with a higher rating in another category results in a final rating of low, moderate, or high susceptibility. Potential contaminants are divided into four categories: IOCs, (i.e., nitrates, arsenic), VOCs, (i.e., petroleum products), SOCs, (i.e., pesticides), and microbial contaminants (i.e., bacteria). As different drinking water sources can be subject to various contamination settings, separate scores are given for each type of contaminant.

In terms of total susceptibility, the Ledge Creek Springs #1 and #2 each rated high for IOCs and SOCs, and moderate for VOCs and microbials. System construction rated high in each spring. The potential contaminant inventory and land use scores were moderate for IOCs, VOCs, SOCs, and microbial contaminants.

In terms of total susceptibility, the Ledge Creek Springs #4 and "A" each rated moderate for IOCs, VOCs, SOCs, and microbials. System construction scores were moderate. The potential contaminant inventory and land use scores were moderate for IOCs, VOCs, SOCs, and microbial contaminants.

In terms of total susceptibility, the Formation Spring rated moderate for IOCs, VOCs, SOCs, and microbial contaminants. The system construction score was moderate. The potential contaminant inventory and land use scores were moderate for IOCs, VOCs, SOCs, and microbial contaminants.

This assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what ranking a source receives, protection is always important. Whether the source is currently located in a "pristine" area or an area with numerous industrial and/or agricultural land uses that require surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources. If the system should need to expand in the future, new well or spring sites should be located in areas with as few potential sources of contamination as possible, and the site should be reserved and protected for this specific use.

For the City of Soda Springs, drinking water protection activities should first focus on correcting any deficiencies outlined in the sanitary survey (an inspection conducted every five years with the purpose of determining the physical condition of a water system's components and its capacity). If arsenic continues to be of concern, the water system should investigate how to treat for it before the 2006 new MCL compliance date (www.epa.gov). In an effort to assist drinking water systems in meeting the new arsenic requirement, the EPA (2002) recently released an issue paper entitled *Proven Alternatives for Aboveground Treatment of Arsenic in Groundwater*. The document at http://www.epa.gov/safewater/ars/techcosts.pdf is also very informational. Land uses within most of the source water assessment areas are outside the direct jurisdiction of City of Soda Springs. Therefore partnerships with state and local agencies, industrial and commercial groups should be established to ensure future land uses are protective of ground water quality.

Due to the time involved with the movement of ground water, drinking water protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. A strong public education program should be a primary focus of any drinking water protection plan as the delineations are near urban and residential land uses areas. Public education topics could include proper lawn and garden care practices, household hazardous waste disposal methods, proper care and maintenance of septic systems, and the importance of water conservation to name but a few. There are multiple resources available to help communities implement protection programs, including the Drinking Water Academy of the EPA. As a major railroad corridor intersects some of the delineations, the Union Pacific Railroad may need to be involved in protection efforts. Drinking water protection activities for agriculture should be coordinated with the Idaho State Department of Agriculture, the Caribou County Soil Conservation District, and the Natural Resources Conservation Service.

A community must incorporate a variety of strategies in order to develop a comprehensive drinking water protection plan, be they regulatory in nature (e.g., zoning, permitting) or non-regulatory in nature (e.g., good housekeeping, public education, specific best management practices). For assistance in developing protection strategies please contact the Pocatello Regional Office of the Idaho Department of Environmental Quality or the Idaho Rural Water Association.

SOURCE WATER ASSESSMENT FOR CITY OF SODA SPRINGS, IDAHO

Section 1. Introduction - Basis for Assessment

The following sections contain information necessary to understand how and why this assessment was conducted. **It is important to review this information to understand what the ranking of this assessment means.** Maps showing the delineated source water assessment area and the inventory of significant potential sources of contamination identified within that area are included. The list of significant potential contaminant source categories and their rankings used to develop the assessment also is included.

Level of Accuracy and Purpose of the Assessment

The Idaho Department of Environmental Quality (DEQ) is required by the U.S. Environmental Protection Agency (EPA) to assess over 2,900 public drinking water sources in Idaho for their relative susceptibility to contaminants regulated by the Safe Drinking Water Act. This assessment is based on a land use inventory of the delineated assessment area, sensitivity factors associated with the springs, and aquifer characteristics. All assessments must be completed by May of 2003. The resources and time available to accomplish assessments are limited. Therefore, an in-depth, site-specific investigation to identify each significant potential source of contamination for every public water system is not possible. **This assessment should be used as a planning tool, taken into account with local knowledge and concerns, to develop and implement appropriate protection measures for this source. The results should <u>not be</u> used as an absolute measure of risk and they should <u>not be</u> used to undermine public confidence in the public water system (PWS).**

The ultimate goal of the assessment is to provide data to local communities to develop a protection strategy for their drinking water supply system. DEQ recognizes that pollution prevention activities generally require less time and money to implement than treatment of a public water supply system once it has been contaminated. DEQ encourages communities to balance resource protection with economic growth and development. The decision as to the amount and types of information necessary to develop a drinking water protection program should be determined by the local community based on its own needs and limitations. Wellhead or drinking water protection is one facet of a comprehensive growth plan, and it can complement ongoing local planning efforts.

Section 2. Conducting the Assessment

General Description of the Source Water Quality

The City of Soda Springs (PWS #6150017) is a community drinking water system that consists of five spring sources: Formation Spring, Ledge Creek Springs #1, #2, #4 and Ledge Creek "A." The Formation Spring is located approximately 2.5 miles northeast of the City of Soda Springs. The Ledge Creek Springs (#1, #2, #4, "A") are located approximately one mile northeast of the City of Soda Springs (Figure 1). Water is fed to a one million-gallon storage reservoir and treated using gas chlorination. The system currently serves approximately 3,300 persons through 1,550 unmetered connections.

No volatile organic chemicals (VOCs) or synthetic organic chemicals (SOCs) have been detected at the spring sources. Furthermore, no microbial contaminants have been detected in the distribution system. The inorganic chemicals (IOCs) barium, fluoride, nitrate, selenium, and beryllium have been detected in the drinking water, but at levels below the maximum contaminant level (MCL) for each chemical. Formation Spring detected arsenic in January 1998, 1999, and 2000 with concentrations ranging from 0.005 milligrams per liter (mg/L) to 0.009 mg/L. The Ledge Creek Springs detected arsenic in January 2000 at a concentration of 0.006 mg/L. In October 2001, the EPA lowered the arsenic MCL from 0.050 mg/L to 0.010 mg/L , giving systems until 2006 to comply with the new standard. EPA requires reporting to the consumer confidence report (CCR) if concentrations of regulated compounds are greater than half their MCL. Further information and health side effects can be researched at http://www.epa.gov/safewater/ccr1.html.

Defining the Zones of Contribution – Delineation

The delineation process establishes the physical area around a spring that will become the focal point of the assessment. The process includes mapping the boundaries of the zone of contribution into time-of-travel (TOT) zones (zones indicating the number of years necessary for a particle of water to reach a spring) for water in the aquifer. Washington Group International (WGI) was contracted by DEQ to define the PWS's zones of contribution. WGI used a conceptual computer model approved by the EPA in determining an estimate of the 3-year (Zone 1B), 6-year (Zone 2), and 10-year (Zone 3) TOT for water associated with the "None" hydrologic province in the vicinity of the City of Soda Springs. The computer model used site specific data, assimilated by WGI from a variety of sources including operator records and hydrogeologic reports. A summary of the hydrogeologic information from the WGI is provided below.

Hydrogeologic Conceptual Model

Graham and Campbell (1981) identified and described 70 regional ground water systems throughout Idaho. Thirty-four of these fall within the southeastern part of the state. The "None" hydrologic province, as defined in this report, includes all the area outside of the 34 regional systems in southeast Idaho. The smaller and more localized aquifers in the "None" province typically are situated in the foothills and mountains that surround and recharge the regional ground water systems.

The mountains and valleys within the “None” hydrologic province were formed during two events separated by approximately 50 to 70 million years (Alt and Hyndman, 1989, pp. 329 and 336). The overthrust belt of the northern Rocky Mountains was formed roughly 70 to 90 million years ago through the intrusion of granitic magma and a massive eastward movement of large slabs of layered sedimentary rocks along faults that dip shallowly westward (Alt and Hyndman, 1989, p. 329). This movement caused extreme folding and fracturing of the sedimentary and granitic rocks and, in many cases, left older formations lying on top of younger ones. Later Basin and Range block faulting broke up the largely eroded Rocky Mountains into large uplifted and downthrown blocks resulting in the present day northwest trending mountains and valleys seen throughout southeast Idaho. Paleozoic and Precambrian limestone, dolomite, sandstone, shale, siltstone, and quartzite are the predominant materials forming the mountains and probable compose the bedrock underlying the valleys between Salmon, Idaho on the north side of the Snake River Plane and Franklin, Idaho near the Utah/Idaho border (Dion, 1969, p.18; Kariya et al., 1994, p. 6; Bjorklund and McGreevy, 1971, p. 12; and Parliman, 1982, p. 9).

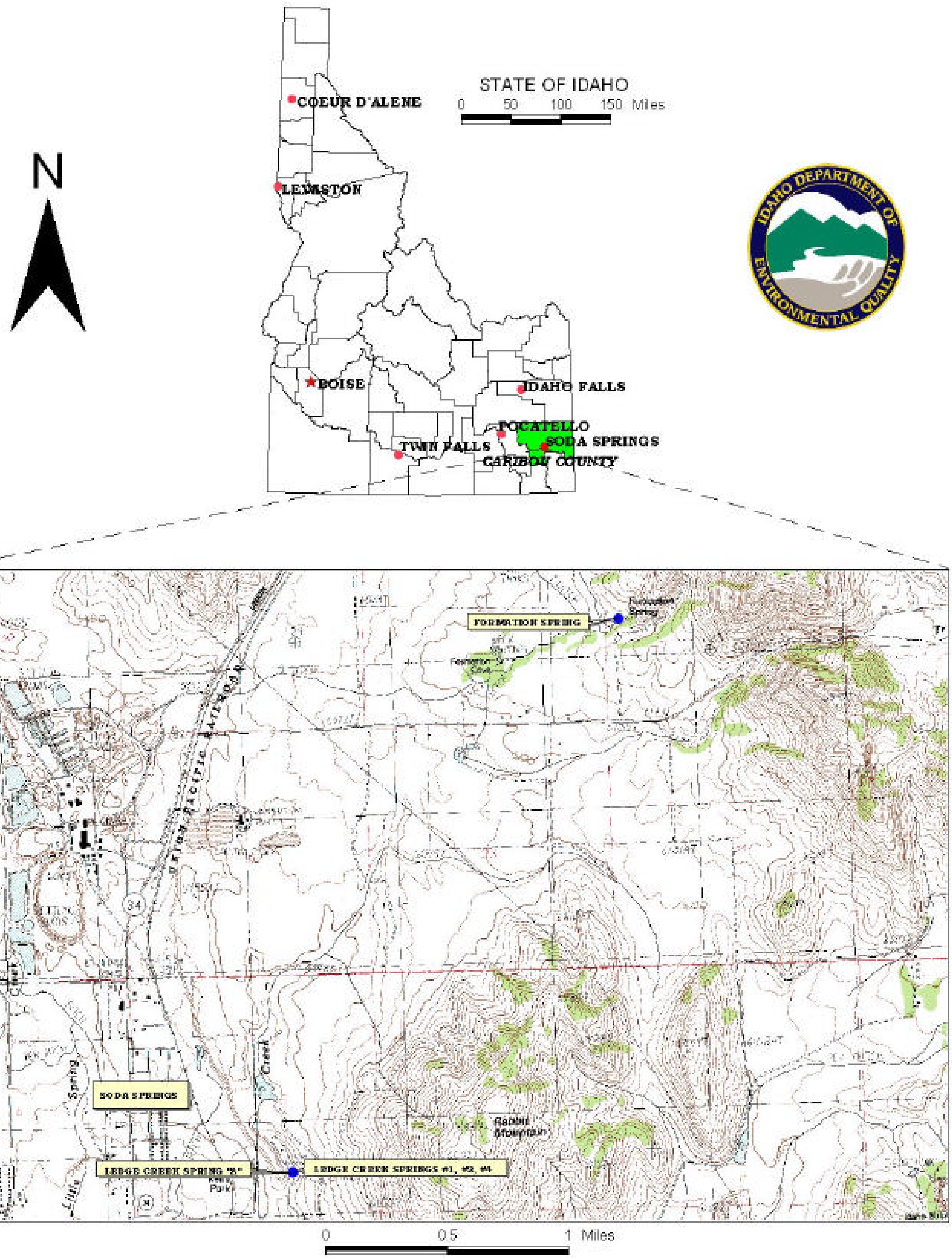
Ground water movement in the mountains is primarily through a system of solution channels, fractures and joints that commonly transmit water independently of surface topography (Bjorklund and McGreevy, 1971, p. 15; Dion, 1969, p. 18). Ralston and others (1979, pp. 128-129) state that the geologic structural features also can contribute to the development of cross-basin ground-water flow systems. Ground water entering a geologic formation tends to follow the formation because hydraulic conductivities are greater parallel to the bedding planes than across them. Synclines and anticlines provide structural avenues for groundwater flow under ridges from one valley to another.

The average annual precipitation in the mountains of southeast Idaho ranges from 20 inches on ridges near Soda Springs to over 45 inches on the Bear River Range (Ralston and Trihey, 1975, p. 7, and Dion, 1969, p. 11). The valleys receive an average of 7 to 10 inches annually (Donato, 1998, p. 3, and Dion, 1969, p. 11). Precipitation and seepage from streams are the primary source of recharge to the mountain aquifers (Kariya, et al., 1994, p. 18, and Parliman,1982, p. 13).

Ground-water discharge occurs as springs and seeps issuing from faults, fractures, and solution channels and as underflow to regional aquifers. The Bear River Basin in the far southeast corner of the state contains hundreds of springs issuing primarily from fractures and solution openings in the bedrock mountains (Dion, 1969, p. 47, and Bjorklund and McGreevy, 1971, pp. 34-35). Within Cache Valley many springs discharge from the valley-fill deposits (Kariya et al., 1994, p. 32).

There is little available information on the distribution of hydraulic head and the hydraulic properties of the aquifers in the “None” hydrologic province. No USGS (2001) or Idaho Statewide Monitoring Network (Neely, 2001) wells are located in the areas of concern to provide information on ground-water flow direction and hydraulic gradient or to aid in model calibration. The information that is available indicates that the hydraulic properties are quite variable, even within a specific rock type. Ralston and others (1979, p. 31), for example, present hydraulic conductivity estimates for fractured chert ranging from 2.2 to 75 ft/day. Estimates for phosphatic shale are as low as 0.07 ft/day (unfractured) and as high as 25 ft/day (fractured).

FIGURE 1. Geographic Location of the City of Soda Springs



Spring Delineation Methods

A spring is defined as a concentrated discharge of ground water appearing at the ground surface as flowing water (Todd, 1980). The discharge of a spring depends on the hydraulic conductivity of the aquifer, the area of contributing recharge to the aquifer, and the rate of aquifer recharge. PWS springs are generally perennial. Large seasonal changes in the discharge rates are an indication of a relatively shallow flow system. While most springs fluctuate in their rate of discharge, springs in volcanic rock (e.g., basalt) are noted for their nearly constant discharge (Todd, 1980).

Delineation of the drinking water protection area for a spring involves special consideration. Hydrogeologic setting is foremost among the factors that control the shape and extent of the capture zone. A spring resulting from the presence of a high permeability fracture extending to great depth will have a much different capture zone than a depression spring formed where the ground surface intersects the water table in a unconsolidated aquifer. In the case of the springs for Soda Springs, the refined method incorporating the soda basalt model was applied.

Refined Method

Springs located within hydrologic provinces and within previously simulated aquifers were delineated using the refined method. The refined method (using the uniform flow option in WhAEM) was also used for springs that generally lacked hydrologic data but had a reasonable basis for predicting ground water flow direction and were located outside previously simulated flow domains.

Previously constructed WhAEM ground water flow models were used to evaluate PWS springs producing water for the City of Soda Springs. This approach involves the assumption that the springs produce from the same aquifer that was simulated with the Soda Basalt model. Source areas for the springs of the City of Soda Springs were delineated using the Soda Basalt model (WGI, 2002b). The springs were placed in the models at the appropriate locations and simulated as constant rate pumping wells. No alterations other than the addition of springs were made to the Soda Basalt model and the original calibration was maintained. The model input remained consistent with the original model and calibration was performed by adjusting the head along the constant-head boundaries. The four Ledge Creek springs were treated as a single source due to their proximity to one another and pumped at the combined average discharge rate of 836,576 cubic feet per day (ft^3/day). The average daily rate reported by the owner/operator or the State of Idaho PWS Inventory Form was used for the remaining three springs.

Reevaluation of the City of Soda Springs Delineations

After the initial delineation was distributed to the operator, additional ground water information was submitted to DEQ and incorporated into the ground water flow models for the springs. The 1988 report, *Evaluation of Ground Water As A Water Supply Source For the City of Soda Springs*, provided by the City of Soda Springs included geological and geochemical information that was not previously considered.

Formation and Ledger springs are located on the eastern side of the valley east-northeast of the City of Soda Springs. Formation Spring lies further to the east in the foothills of the Aspen Range. The discharge of the springs is substantial with Formation Spring discharging approximately 17 to 20+ cfs while Ledger Spring discharges about 5 to 10 cfs. The springs are located in the geologically complex Meade Thrust Belt and were classified as periphery extension springs associated with the area of deep, concentrated, high-angle, extension faulting in the western portion of the Aspen Range (Mayo, et al, 1985). The geology of the area has been mapped (Armstrong, 1969; Gulbrandsen et al, 1956) and the relationships between the structural geology and ground water flow systems have been extensively investigated (Ralston, et al,1980; Ralston et al, 1983; Ralston, 1984; Ralston, 1988). The geochemistry of the springs have also been studied (Mitchell, Hutsinpiller and Parry, 1985, Mayo et al, 1985)

The results of the investigations cited above as well as other considerations with respect to the sources of water contributing to springflow indicate the following:

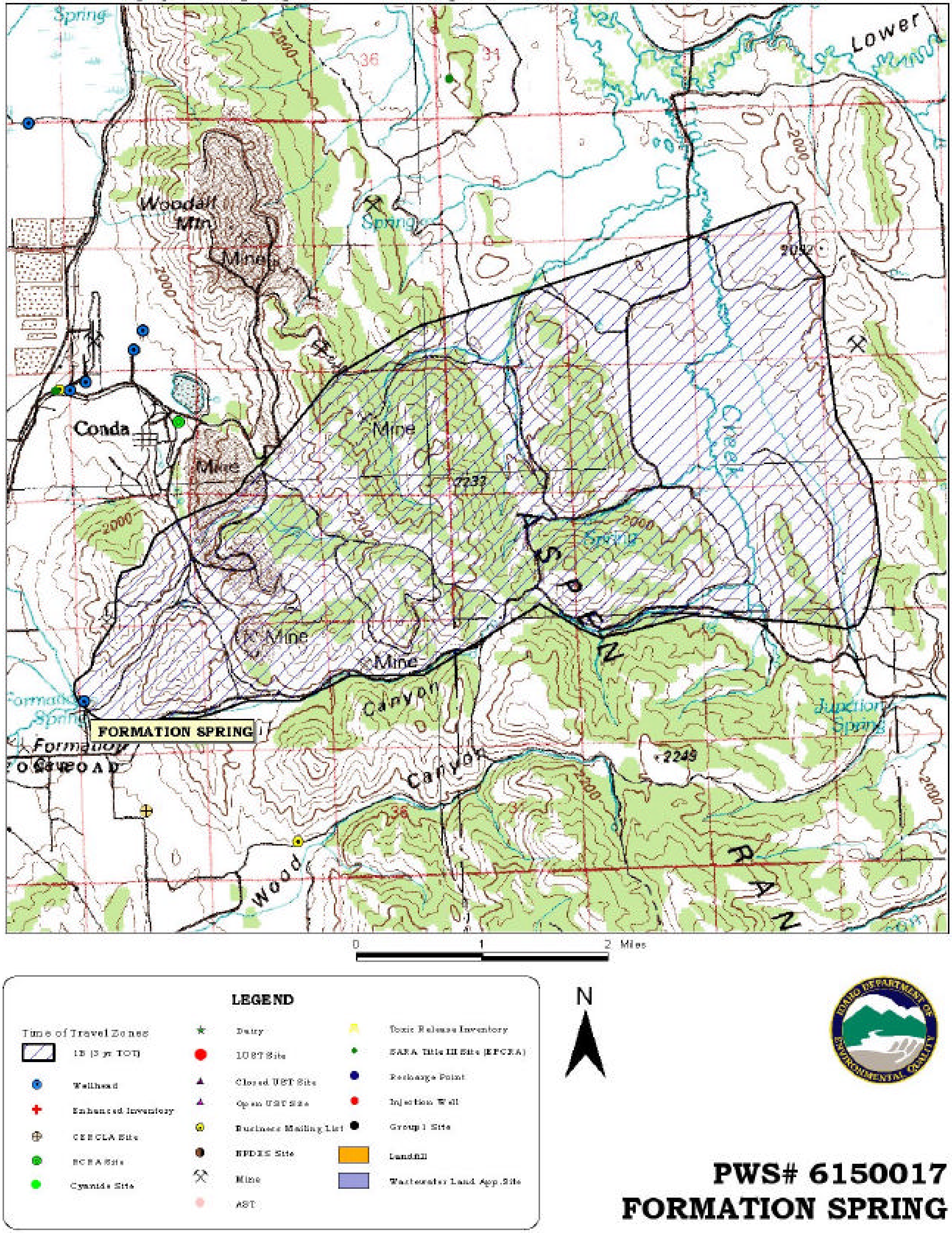
- The discharge of Formation Spring is large enough and constant in nature. This indicates a ground water flow system with great storage capacity. Typical assumptions regarding the magnitude of areal recharge (as a percentage of annual precipitation) would require very large land areas (outside the immediate topographic boundaries of the Aspen Range itself) and are inadequate to supply the discharge that is measured. This implies areas of concentrated recharge such as along streams, fault zones, and exposed permeable rock units, a significant land area for recharge outside the topographic and structural constraints of the Aspen range proper, or some combination of the two.

- Formation Spring likely derives its water from the carbonate rocks of the Aspen Range and other ranges to the east. The ground water system associated with Formation Spring likely circulates at great depths, from 100 to 2,000 meters or more below ground surface, likely reaching the base of the Meade thrust fault. These large circulation depths imply regional scale structural controls on the flow paths and sources of recharge to the spring.

- The age of the water issuing from Formation Spring has been dated to be quite old (14,500 years before present (B.P.)). There is some uncertainty as to the interpretation of this age however. It has been theorized that carbon dioxide present in the spring (depleted in C^{14}) may have been transported from it's source in deep ground water, mixed with and diluted younger ground water, resulting in a residence time that is artificially long. It may also be that Formation Spring water is a mixture of younger and older water sources.

- Ledger Spring's source is probably water from Formation Spring, which recharges the upper basalt zone (UBZ) aquifer directly upgradient of Ledger. The water quality of the two springs is very similar (Ralston, 1988). While located in the vicinity of an inferred fault the location of the fault is west of the primary extension fault zone associated with the Aspen Range.

FIGURE 2. City of Soda Springs Delineation Map and Potential Contaminant Source Locations



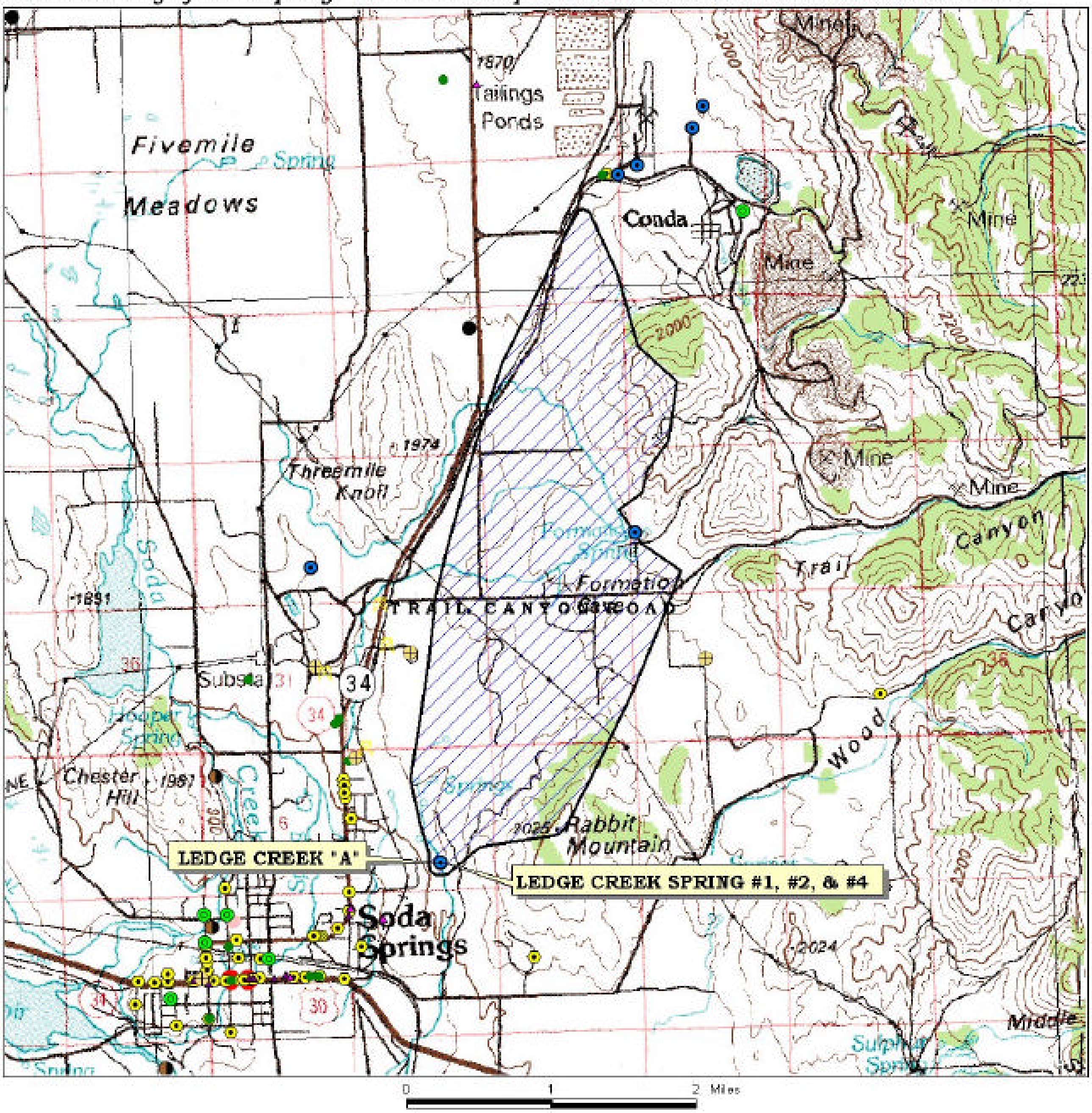
PWS# 6150017
FORMATION SPRING

The revised delineation for Formation Spring is approximately 15.6 square miles in size and extends approximately six miles to the east into the foothills east of Trail Creek (Figure 2). Ralston, et al., (1983) indicate that the probable recharge areas for the periphery extension springs, of which Formation is the largest, are the "Interior" valleys between the Aspen and Webster Ranges and valleys just to the east of the Aspen Range. The upgradient terminis of the delineation was located in the vicinity of a major north-trending fault mapped by Gulbrandsen et al. (1956) that may provide a mechanism for deep recharge. The offset and depth of the fault is unknown. The northern and southern boundaries of the source area delineation were located based on the description by Ralston, et al. (1983). Flowpaths of the ground water system associated with the periphery extension springs are seen as being controlled by bedding planes and are generally perpendicular to major structural features such as axial fold traces. Other general structural considerations such as the location and orientation of faults and the permeability characteristics and strike and dip of geologic units which may function as areas of local, concentrated recharge and direct recharge toward the spring outlet are also used. No TOT estimates are possible for the delineated area given the complex nature of the source of the springs and the uncertainty regarding measured estimates of ground water residence time.

The revised delineation for Ledger Spring (Figure 3) is based primarily on the assumptions that the spring occurs in the UBZ aquifer and that the major source of recharge to the spring is from water discharged into the UBZ by Formation Spring. Smaller amounts of recharge are contributed by discharge off the Aspen range further north of Formation Spring into the basalt. Maps of the direction of ground water flow in the UBZ from Dion (1974) and the modeled UBZ ground water surface by Monsanto Corporation (2002) provide the basis for the delineation. Based on the modeled hydraulic conductivity (400 feet/day), gradient (0.013) for the Ledger Spring portion of the model and basalt porosity of 0.15 the estimated travel time from Formation Spring to Ledger Spring is about 1 year. Therefore the entire delineation represents a 0-3 year TOT.

It should be emphasized that, due to the geologic complexity of the area there remains a significant degree of uncertainty in these revised delineations. However, taking into account the regional structural controls on ground water flow for the springs in these locations has resulted in a more accurate depiction of probable source water areas. The delineated area for Formation Spring can best be described as a sector approximately 6 miles long, just passing Trail Creek, approximately 3 miles across at its widest point, and bounded to the south by Trail Canyon. The delineated area for Ledge Creek Spring and Springs #1, #2, #4, and "A" can best be described as a north-northeast trending lobe approximately 4 miles long and approximately 1.5 miles wide which is bounded by the railroad on the west and the mountain front on the east. The actual data used in determining the source water assessment delineation area is available from DEQ upon request.

FIGURE 3. City of Soda Springs Delineation Map and Potential Contaminant Source Locations



PWS# 6150017
LEDGE CREEK
SPRING #1,#2,#4 & "A"

Identifying Potential Sources of Contamination

A potential source of contamination is defined as any facility or activity that stores, uses, or produces, as a product or by-product, the contaminants regulated under the Safe Drinking Water Act. Furthermore, these sources have a sufficient likelihood of releasing such contaminants into the environment at levels that could pose a concern relative to drinking water sources. The goal of the inventory process is to locate and describe those facilities, land uses, and environmental conditions that are potential sources of ground water contamination. Field surveys conducted by DEQ and reviews of available databases did not identify any potential contaminant point sources within the delineated areas. However, a U.S. Geological Survey (USGS) 7.5-minute quadrangle for Soda Springs, indicated potential contaminant sources including mines, a railroad, Trail Canyon Road, and Trail Canyon Creek.

It is important to understand that a release may never occur from a potential source of contamination provided they are using best management practices. Many potential sources of contamination are regulated at the federal level, state level, or both to reduce the risk of release. Therefore, when a business, facility, or property is identified as a potential contaminant source, this should not be interpreted to mean that this business, facility, or property is in violation of any local, state, or federal environmental law or regulation. What it does mean is that the potential for contamination exists due to the nature of the business, industry, or operation. There are a number of methods that water systems can use to work cooperatively with potential sources of contamination, including educational visits and inspections of stored materials. Many owners of such facilities may not even be aware that they are located near a public water supply source.

Contaminant Source Inventory Process

A two-phased contaminant inventory of the study area was conducted in March and April 2002. The first phase involved identifying and documenting potential contaminant sources within the City of Soda Springs source water assessment areas through the use of computer databases and Geographic Information System (GIS) maps developed by DEQ. The second, or enhanced, phase of the contaminant inventory involved contacting the operator to identify and add any additional potential sources in the delineated areas. This task was undertaken with the assistance of Mr. Gene Lish and Mr. Lee Godfrey. At the time of the enhanced inventory, additional potential contaminant sources were found within the delineated source water area due to the additional ground water information provided by the water system. Maps with spring locations, delineated areas and potential contaminant sources are provided with this report (Figure 2, 3, Tables 1, 2).

Table 1. City of Soda Springs, Formation Spring, Potential Contaminant Inventory

Site #	Source Description[1]	TOT Zone[2] (years)	Source of Information	Potential Contaminants[3]
	Historical Mine	0-3	GIS Map	IOC
	Historical Mine	0-3	GIS Map	IOC
	Historical Mine	0-3	GIS Map	IOC
	Trail Creek	0-3	GIS Map	IOC, VOC, SOC, Microbials
	Trail Canyon Road	0–3	GIS Map	IOC, VOC, SOC, Microbials

[2] TOT = time-of-travel (in years) for a potential contaminant to reach the spring

[3] IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical

Table 2. City of Soda Springs, Potential Contaminant Inventory for Ledge Creek Springs #1, #2, #4 and "A."

Site #	Source Description[1]	TOT Zone[2] (years)	Source of Information	Potential Contaminants[3]
	Railroad	0–3	GIS Map	IOC, VOC, SOC, Microbials
	Trail Creek	0-3	GIS Map	IOC, VOC, SOC, Microbials
	Trail Canyon Road	0–3	GIS Map	IOC, VOC, SOC, Microbials

[2] TOT = time-of-travel (in years) for a potential contaminant to reach the spring
[3] IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical

Section 3. Susceptibility Analyses

The springs' susceptibility to contamination were ranked as high, moderate, or low risk according to the following considerations: spring construction, land use characteristics, and potentially significant contaminant sources. The susceptibility rankings are specific to a particular potential contaminant or category of contaminants. Therefore, a high susceptibility rating relative to one potential contaminant does not mean that the water system is at the same risk for all other potential contaminants. The relative ranking that is derived for each spring is a qualitative, screening-level step that, in many cases, uses generalized assumptions and best professional judgement. Attachment A contains the susceptibility analysis worksheets. The following summaries describe the rationale for the susceptibility ranking.

System Construction

Spring construction scores are determined by evaluating whether the spring has been constructed according to Idaho Code (IDAPA 58.01.08.04) and if the spring's water is exposed to any potential contaminants from the time it exits the bedrock to when it enters the distribution system. If the spring's intake structure, infiltration gallery, and housing are located and constructed in such a manner as to be permanent and protect it from all potential contaminants, is contained within a fenced area of at least 100 feet in diameter, and is protected from all surface water by diversions, berms, etc., then Idaho Code is being met and the score will be lower. If the spring's water comes in contact with the open atmosphere before it enters the distribution system, it receives a higher score. Likewise, if the spring's water is piped directly from the bedrock to the distribution system or is collected in a protected spring box without any contact to potential surface-related contaminants, the score is lower.

The Formation Spring is located approximately 2.5 miles northeast of the City of Soda Springs. Although the city owns the water right, the Formation Spring is located on privately owned land. The Ledge Creek Springs (#1, #2, #4, and "A") are located approximately one mile northeast of the City of Soda Springs. The land where the springs are located is owned by the city.

Ledge Creek Springs #1 and #2 rated high for system construction. The sanitary survey states that the area surrounding the springs is not fenced and the spring house is not constructed in such a manner as to prevent rodents, insects, or surface water from entering it.

Ledge Creek Spring #4 rated moderate for system construction. Water is collected and enters the distribution system without contacting the atmosphere, however, the 2000 Sanitary Survey stated that the area surrounding the well is not fenced.

The Ledge Creek "A" rated moderate for system construction. The sanitary survey states that the spring was rehabilitated in 1999. However, the sanitary survey stated that the area within 100 feet of the spring needs to be properly fenced.

The Formation Spring rated moderate for system construction. The 2000 sanitary survey (conducted by DEQ) states that the spring area is fenced. The source consists of a 16-inch diameter pipe extending approximately 20 feet vertically to the bottom of a pond created by the spring. The pipe elbows 90 degrees below the surface of the pond and extends to a screening box nearby. Water from the Ledge Creek Springs originates from under rock ledges, where it is captured in springhouses and piped to the treatment system and storage reservoir. Water that is exposed to the atmosphere prior to entering the distribution, such as the pond or rock ledges, is more susceptible to contamination and receives a more conservative rating.

Potential Contaminant Source and Land Use

The potential contaminant sources and land use within the delineated zones of water contribution are assessed to determine each spring's susceptibility. When agriculture is the predominant land use in the area, this may increase the likelihood of agricultural wastewater infiltrating the ground water system. Agricultural land is counted as a source of leachable contaminants and points are assigned to this rating based on the percentage of agricultural land. The land use within the area surrounding the Ledge Creek spring sources is predominately irrigated pasture, while the land use within the area surrounding the Formation spring is predominantly rangeland.

In terms of potential contaminant sources, the land use susceptibility ratings are as follows: The Ledge Creek Springs and Formation Spring rated moderate for IOCs (i.e., nitrates, arsenic), VOCs (i.e., petroleum products), SOCs (i.e., pesticides), and microbial contaminants (i.e., bacteria). The number and location of potential contaminant sources and the amount of agricultural land within each delineation contributed to the scores.

Final Susceptibility Ranking

A detection above a drinking water standard MCL, any detection of a VOC or SOC at the spring source will automatically give a high susceptibility rating to a spring despite the land use of the area because a pathway for contamination already exists. Additionally, potential contaminant sources within 100 feet of a spring source will automatically lead to a high susceptibility rating. The amount of agricultural land and the relatively small number of potential contaminant sources in the 0- to 3-year TOT zone (Zone 1B) had the largest influence upon overall rankings.

Table 3. Summary of City of Soda Springs Susceptibility Evaluation

Drinking Water Sources	Susceptibility Scores[1]								
	Potential Contaminant Inventory and Land Use				System Construction	Final Susceptibility Ranking			
	IOC	VOC	SOC	Microbials		IOC	VOC	SOC	Microbials
Formation Spring	M	M	M	M	M	M	M	M	M
Ledge Creek Springs #1, #2	M	M	M	M	H	H	M	H	M
Ledge Creek Springs #4	M	M	M	M	M	M	M	M	M
Ledge Creek Spring A	M	M	M	M	M	M	M	M	M

[1]H = High Susceptibility, M = Moderate Susceptibility, L = Low Susceptibility,
IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical

Susceptibility Summary

In terms of total susceptibility, the Ledge Creek Springs #1 and #2 each rated high for IOCs and SOCs, and moderate for VOCs and microbials. System construction rated high in each spring. The potential contaminant inventory and land use scores were moderate for IOCs, VOCs, SOCs, and microbial contaminants.

In terms of total susceptibility, the Ledge Creek Springs #4 and "A" each rated moderate for IOCs, VOCs, SOCs, and microbials. System construction scores were moderate. The potential contaminant inventory and land use scores were moderate for IOCs, VOCs, SOCs, and microbial contaminants.

In terms of total susceptibility, the Formation Spring rated moderate for IOCs, VOCs, SOCs, and microbial contaminants. The system construction score was moderate. The potential contaminant inventory and land use scores were moderate for IOCs, VOCs, SOCs, and microbial contaminants.

No VOCs or SOCs have been detected at the spring sources. Furthermore, our records indicate no microbial contaminants have been detected in the distribution system. The IOCs barium, fluoride, nitrate, selenium, and beryllium have been detected in the drinking water, but at levels below the MCL for each chemical. Formation Spring detected arsenic in January 1998, 1999, and 2000 with concentrations ranging from 0.05 mg/ L to 0.09 mg/ L. The Ledge Creek Springs detected arsenic in January 2000 at a concentration of 0.06 mg/ L. In October 2001, the EPA lowered the arsenic MCL from 0.050 mg/ L to 0.010 mg/ L, giving systems until 2006 to comply with the new standard.

Section 4. Options for Drinking Water Protection

This assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what ranking a source receives, protection is always important. Whether the source is currently located in a "pristine" area or an area with numerous industrial and/or agricultural land uses that require surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources. If the system should need to expand in the future, new drinking water sources should be located in areas with as few potential sources of contamination as possible, and the site should be reserved and protected for this specific use.

For the City of Soda Springs, drinking water protection activities should first focus on correcting any deficiencies outlined in the sanitary survey. The water system may also want to be proactive in investigating how to treat for arsenic before the 2006 compliance date for the new arsenic MCL (www.epa.gov). In an effort to assist drinking water systems in meeting the new arsenic standard, the EPA (2002) recently released an issue paper entitled *Proven Alternatives for Aboveground Treatment of Arsenic in Groundwater*. Land uses within most of the source water assessment areas are outside the direct jurisdiction of City of Soda Springs. Therefore partnerships with state and local agencies, industrial and commercial groups should be established to ensure future land uses are protective of ground water quality

Due to the time involved with the movement of ground water, drinking water protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. A strong public education program should be a primary focus of any drinking water protection plan as the delineations are near urban and residential land uses areas. Public education topics could include proper lawn and garden care practices, household hazardous waste disposal methods, proper care and maintenance of septic systems, and the importance of water conservation to name but a few. There are multiple resources available to help communities implement protection programs, including the Drinking Water Academy of the EPA. As a major railroad corridor intersects some of the delineations the Union Pacific Railroad may need to be involved in protection efforts. Drinking water protection activities for agriculture should be coordinated with the Idaho State Department of Agriculture, the Caribou County Soil Conservation and Water District, and the Natural Resources Conservation Service.

A community must incorporate a variety of strategies in order to develop a comprehensive drinking water protection plan, be they regulatory in nature (e.g., zoning, permitting) or non-regulatory in nature (e.g., good housekeeping, public education, specific best management practices). For assistance in developing protection strategies please contact the Pocatello Regional Office of the DEQ or the Idaho Rural Water Association.

Assistance

Public water supplies and others may call the following DEQ offices with questions about this assessment and to request assistance with developing and implementing a local protection plan. In addition, draft protection plans may be submitted to the DEQ office for preliminary review and comments.

Pocatello Regional DEQ Office	(208) 236-6160
State DEQ Office	(208) 373-0502

Website: http://www.deq.state.id.us

Water suppliers serving fewer than 10,000 persons may contact Ms. Melinda Harper at (208) 343-7001 or email her at mlharper@idahoruralwater.com for assistance with drinking water protection (formerly wellhead protection) strategies.

POTENTIAL CONTAMINANT INVENTORY LIST OF ACRONYMS AND DEFINITIONS

AST (Aboveground Storage Tanks) – Sites with aboveground storage tanks.

Business Mailing List – This list contains potential contaminant sites identified through a yellow pages database search of standard industry codes (SIC).

CERCLIS – This includes sites considered for listing under the **Comprehensive Environmental Response Compensation and Liability Act (CERCLA)**. CERCLA, more commonly known as Superfund is designed to clean up hazardous waste sites that are on the national priority list (NPL).

Cyanide Site – DEQ permitted and known historical sites/facilities using cyanide.

Dairy – Sites included in the primary contaminant source inventory represent those facilities regulated by Idaho State Department of Agriculture (ISDA) and may range from a few head to several thousand head of milking cows.

Deep Injection Well – Injection wells regulated under the Idaho Department of Water Resources generally for the disposal of stormwater runoff or agricultural field drainage.

Enhanced Inventory – Enhanced inventory locations are potential contaminant source sites added by the water system. These can include new sites not captured during the primary contaminant inventory, or corrected locations for sites not properly located during the primary contaminant inventory. Enhanced inventory sites can also include miscellaneous sites added by the Idaho Department of Environmental Quality (DEQ) during the primary contaminant inventory.

Floodplain – This is a coverage of the 100-year floodplains.

Group 1 Sites – These are sites that show elevated levels of contaminants and are not within the priority one areas.

Inorganic Priority Area – Priority one areas where greater than 25% of the wells/springs show constituents higher than primary standards or other health standards.

Landfill – Areas of open and closed municipal and non-municipal landfills.

LUST (Leaking Underground Storage Tank) – Potential contaminant source sites associated with leaking underground storage tanks as regulated under RCRA.

Mines and Quarries – Mines and quarries permitted through the Idaho Department of Lands.)

Nitrate Priority Area – Area where greater than 25% of wells/springs show nitrate values above 5 mg/l.

NPDES (National Pollutant Discharge Elimination System) – Sites with NPDES permits. The Clean Water Act requires that any discharge of a pollutant to waters of the United States from a point source must be authorized by an NPDES permit.

Organic Priority Areas – These are any areas where greater than 25% of wells/springs show levels greater than 1% of the primary standard or other health standards.

Recharge Point – This includes active, proposed, and possible recharge sites on the Snake River Plain.

RCRA – Site regulated under **Resource Conservation Recovery Act (RCRA)**. RCRA is commonly associated with the cradle to grave management approach for generation, storage, and disposal of hazardous wastes.

SARA Tier II (Superfund Amendments and Reauthorization Act Tier II Facilities) – These sites store certain types and amounts of hazardous materials and must be identified under the Community Right to Know Act.

Toxic Release Inventory (TRI) – The toxic release inventory list was developed as part of the Emergency Planning and Community Right to Know (Community Right to Know) Act passed in 1986. The Community Right to Know Act requires the reporting of any release of a chemical found on the TRI list.

UST (Underground Storage Tank) – Potential contaminant source sites associated with underground storage tanks regulated as regulated under RCRA.

Wastewater Land Applications Sites – These are areas where the land application of municipal or industrial wastewater is permitted by DEQ.

Wellheads – These are drinking water well locations regulated under the Safe Drinking Water Act. They are not treated as potential contaminant sources.

NOTE: Many of the potential contaminant sources were located using a geocoding program where mailing addresses are used to locate a facility. Field verification of potential contaminant sources is an important element of an enhanced inventory.

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WWW.epa.gov/safewater/

Attachment A

City of Soda Springs
Susceptibility Analysis
Worksheets

The final scores for the susceptibility analysis were determined using the following formulas:

1) IOC/VOC/SOC Final Score = (Potential Contaminant/Land Use X 0.818) + System Construction Score.

2) Microbial Final Score = (Potential Contaminant/Land Use x 1.125) + System Construction Score.

Spring Source Final Susceptibility Scoring

0-7 = Low Susceptibility

8-15 = Moderate Susceptibility

16-21 = High Susceptibility

1. System Construction		SCORE
Intake structure and area constructed to meet Idaho Code	NO	1
Does the water enter the distribution system without contacting the atmosphere YES = lower score, NO = higher score	NO	2
Total System Construction Score		3

3. Potential Contaminant / Land Use - ZONE 1A		IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	IRRIGATED PASTURE	1	1	1	1
Farm chemical use high	YES	0	0	2	
IOC, VOC, SOC, or Microbial sources in Zone 1A	NO	NO	NO	NO	NO
Total Potential Contaminant Source/Land Use Score - Zone 1A		1	1	3	1
Potential Contaminant / Land Use - ZONE 1B					
Contaminant sources present (Number of Sources)	YES	3	3	3	3
(Score = # Sources X 2) 8 Points Maximum		6	6	6	6
Sources of Class II or III leacheable contaminants or	YES	7	3	3	
4 Points Maximum		4	3	3	
Zone 1B contains or intercepts a Group 1 Area	YES	2	0	0	0
Land use Zone 1B	Greater Than 50% Irrigated Agricultural Land	4	4	4	4
Total Potential Contaminant Source / Land Use Score - Zone 1B		16	13	13	10
Cumulative Potential Contaminant / Land Use Score		14	11	13	12
4. Final Susceptibility Source Score		17	14	16	15
5. Final Spring Ranking		High	Moderate	High	Moderate

1. System Construction		SCORE
Intake structure and area constructed to meet Idaho Code	NO	1
Does the water enter the distribution system without contacting the atmosphere YES = lower score, NO = higher score	YES	0
Total System Construction Score		1

3. Potential Contaminant / Land Use - ZONE 1A		IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	IRRIGATED PASTURE	1	1	1	1
Farm chemical use high	YES	0	0	2	
IOC, VOC, SOC, or Microbial sources in Zone 1A	NO	NO	NO	NO	NO
Total Potential Contaminant Source/Land Use Score - Zone 1A		1	1	3	1
Potential Contaminant / Land Use - ZONE 1B					
Contaminant sources present (Number of Sources)	YES	3	3	3	3
(Score = # Sources X 2) 8 Points Maximum		6	6	6	6
Sources of Class II or III leacheable contaminants or	YES	7	3	3	
4 Points Maximum		4	3	3	
Zone 1B contains or intercepts a Group 1 Area	YES	2	0	0	0
Land use Zone 1B	Greater Than 50% Irrigated Agricultural Land	4	4	4	4
Total Potential Contaminant Source / Land Use Score - Zone 1B		16	13	13	10
Cumulative Potential Contaminant / Land Use Score		14	11	13	12
4. Final Susceptibility Source Score		15	12	14	13
5. Final Spring Ranking		Moderate	Moderate	Moderate	Moderate

1. System Construction		SCORE
Intake structure and area constructed to meet Idaho Code	NO	1
Does the water enter the distribution system without contacting the atmosphere YES = lower score, NO = higher score	YES	0
Total Sysem Construction Score		1

3. Potential Contaminant / Land Use - ZONE 1A		IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	IRRIGATED PASTURE	1	1	1	1
Farm chemical use high	YES	0	0	2	
IOC, VOC, SOC, or Microbial sources in Zone 1A	NO	NO	NO	NO	NO
Total Potential Contaminant Source/Land Use Score - Zone 1A		1	1	3	1
Potential Contaminant / Land Use - ZONE 1B					
Contaminant sources present (Number of Sources)	YES	3	3	3	3
(Score = # Sources X 2) 8 Points Maximum		6	6	6	6
Sources of Class II or III leacheable contaminants or	YES	7	3	3	
4 Points Maximum		4	3	3	
Zone 1B contains or intercepts a Group 1 Area	YES	2	0	0	0
Land use Zone 1B	Greater Than 50% Irrigated Agricultural Land	4	4	4	4
Total Potential Contaminant Source / Land Use Score - Zone 1B		16	13	13	10
Cumulative Potential Contaminant / Land Use Score		14	11	13	12
4. Final Susceptibility Source Score		15	12	14	13
5. Final Spring Ranking		Moderate	Moderate	Moderate	Moderate

Spring Water Susceptibility Report   Public Water System Name : SODA SPRINGS,CITY OF   FORMATION SPRING

Public Water System Number 6150017   04/22/2002 2:52:38 PM

1. System Construction

		SCORE
Intake structure and area constructed to meet Idaho Code	NO	1
Does the water enter the distribution system without contacting the atmosphere YES = lower score, NO = higher score	YES	0
Total System Construction Score		1

3. Potential Contaminant / Land Use - ZONE 1A

		IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	RANGELAND, BASALT	0	0	0	0
Farm chemical use high	YES	0	0	2	
IOC, VOC, SOC, or Microbial sources in Zone 1A	NO	NO	NO	NO	NO
Total Potential Contaminant Source/Land Use Score - Zone 1A		0	0	2	0

Potential Contaminant / Land Use - ZONE 1B

		IOC Score	VOC Score	SOC Score	Microbial Score
Contaminant sources present (Number of Sources)	YES	5	3	3	3
(Score = # Sources X 2) 8 Points Maximum		8	6	6	6
Sources of Class II or III leacheable contaminants or	YES	2	3	3	
4 Points Maximum		2	3	3	
Zone 1B contains or intercepts a Group 1 Area	YES	2	0	0	0
Land use Zone 1B	Less Than 25% Agricultural Land	0	0	0	0
Total Potential Contaminant Source / Land Use Score - Zone 1B		12	9	9	6
Cumulative Potential Contaminant / Land Use Score		10	8	9	8

	IOC	VOC	SOC	Microbial
4. Final Susceptibility Source Score	11	9	11	9
5. Final Spring Ranking	Moderate	Moderate	Moderate	Moderate